INSTRUCTION MANUAL

HI 96744

pH, Hardness and Iron LR ISM

www.hannainst.com

Dear Customer,

Thank you for choosing a Hanna product. This manual will provide you with the necessary information for the correct use of the instrument. Please read it carefully before using the meter. If you need additional technical information, do not hesitate to e-mail us at tech@hannainst.com.

Preliminary examination:

Please examine this product carefully. Make sure that the instrument is not damaged. If any damage occured during shipment, please notify your Dealer.

Each **HI 96744** Ion Selective Meter is supplied complete with:

- Two Sample Cuvettes and Caps
- 9V Battery
- Instruction Manual

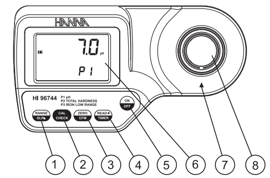
Note: save all packing material until you are sure that the instrument works correctly. Any defective item must be returned in its original packing.

For more details about spare parts and accessories see "Accessories".

Technical specifications:

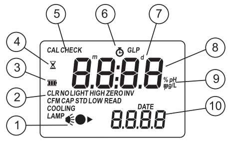
Range	pH	6.5 to 8.5
	Mg Hardness	0.00 to 2.00 mg/L
	Ca Hardness	0.00 to 2.70 mg/L
	Total Hardness	0.00 to 4.70 mg/L
	Iron LR	0.00 to 1.60 mg/L
Resolution		0.1 pH 0.01 mg/L Hardness 0.01 mg/L Iron LR
Accuracy	pH	±0.1 pH @ 25°C
	Mg Hardness	±0.11 mg/L ±5% of reading @ 25°C
	Ca Hardness	±0.11 mg/L ±5% of reading @ 25°C
	Iron LR	±0.01 mg/L ±8% of reading @ 25°C
Typical EMC Dev.		±0.1 pH ±0.02 mg/L Mg Hardness ±0.02 mg/L Ca Hardness ±0.01 mg/L Iron LR
Light Source		Tungsten lamp
Light Detector		Silicon Photocell with narrow band interference filter @ 525 nm
Method		For pH: Phenol red method. The reaction with reagents causes a red tint in the sample. For hardness: Adaptation of the *Standard Methods for the Examination of Water and Wastewater, 18th Edition*, colorimetric method. The reaction between Mg/Ca and reagents causes a violet tint in the sample. For Iron LR: Adaptation of the TPTZ method. The reaction between iron and the reagent causes a violet tint in the sample.
Environment		0 to 50°C (32 to 122°F); max 95% RH non-condensing
Battery Type		1 x 9 volt
Auto-Shut off		After 10' of non-use in measurement mode; after 1 hour of non-use in calibration mode; with last reading reminder.
Dimensions		192 x 104 x 69 mm (7.6 x 4.1 x 2.7")
Weight		360 g (12.7 oz.).

Functional description:



1. **RANGE/GLP/▲** key: press to change the paramter, press and hold for three seconds to enter *GLP mode*. In *calibration mode* press to edit the date and time.
2. **CAL CHECK** key: press to perform the validation of the meter, or press and hold for three seconds to enter *calibration mode*.
3. **ZERO/CFM** key: press to zero the meter prior to measurement, to confirm edited values or to confirm factory calibration restore.
4. **READ/▶/TIMER** key: In *measurement mode*, press to make a measurement, or press and hold for three seconds to start a pre-programmed countdown prior to measurement. In *GLP mode* press to view the next screen.
5. **ON/OFF** key: to turn the meter on and off.
6. Liquid Crystal Display (LCD)
7. Cuvette alignment indicator
8. Cuvette holder

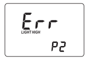
DISPLAY ELEMENTS DESCRIPTION:



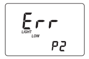
1. The measuring scheme (lamp, cuvette, detector), appears during different phases of zero or reading measurement
2. Error messages and warnings
3. The battery icon indicates the change state level of the battery
4. The hourglass appears when an internal check is in progress
5. Status messages
6. The chronometer appears when the reaction timer is running
7. The month, day and date icons appear when a date is displayed
8. Four digit main display
9. Measuring units
10. Four digit secondary display

Errors and warnings:

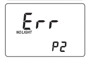
ON ZERO READING:



Light High: There is too much light to perform a measurement. Please check the preparation of the zero cuvette.

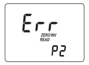


Light Low: There is not enough light to perform a measurement. Please check the preparation of the zero cuvette.

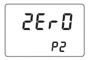


No Light: The instrument cannot adjust the light level. Please check that the sample does not contain any debris.

ON SAMPLE READING:



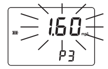
Inverted cuvettes: The sample and the zero cuvette are inverted.



Zero: A zero reading was not taken. Follow the instructions of the measurement procedure for zeroing the meter.

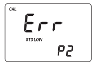


Under range: A blinking **"0.00"** indicates that the sample absorbs less light than the zero reference. Check the procedure and make sure you use the same cuvette for reference (zero) and measurement.

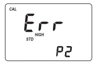


Over Range: A flashing value of the maximum concentration indicates an over range condition. The concentration of the sample is beyond the programmed range: dilute the sample and re-run the test.

DURING CALIBRATION PROCEDURE:

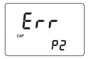


Standard Low: The standard reading is less than expected.

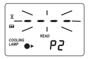


Standard High: The standard reading is higher than expected.

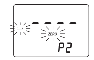
OTHER ERRORS AND WARNINGS:



Cap error: Appears when external light enters in the analysis cell. Assure that the cuvette cap is present.



Cooling lamp: The instrument waits for the lamp to cool down.

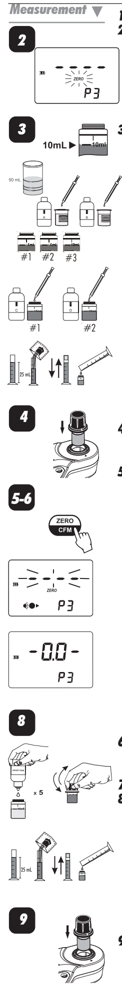


Battery low: The battery must be replaced soon.



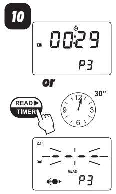
Dead battery: This indicates that the battery is dead and must be replaced. Once this indication is displayed, normal operation of the instrument will be interrupted. Change the battery and restart the meter.

Measurement procedure:



1. Turn the meter on by pressing **ON/OFF**.
2. When the beeper sounds briefly and the LCD displays dashes and "P1" (pH), "P2" (Total Hardness), "P3" (Iron LR) the meter is ready. The code that appears on the secondary display is the one of the last selected parameter. If necessary, press **RANGE/GLP/▲** to change parameter. The blinking **"ZERO"** indicates that the instrument needs to be zeroed first.
3. For pH: Fill the cuvette with 10 mL of unreacted sample, up to the mark, and replace the cap.
   For Total Hardness: Fill a graduated beaker up to the 50mL mark with the sample. Add 0.5 mL of HI 93719A-0 Calcium And Magnesium Reagent indicator solution and mix. Add 0.5 mL of HI 93719B-0 Alkali solution for Calcium and Magnesium and mix. Fill three cuvettes with 10mL of sample each. Add 1 drop of HI 93719C-0 EDTA solution to one cuvette, replace the cap and swirl the solution. This is the ZERO sample. Add 1 drop of HI 93719D-0 EGTA solution to the second cuvette, replace the cap and swirl the solution. This is the READ1 sample.
   For Iron LR: Fill one graduated mixing cylinder up to the 25 mL mark with deionized water. Add the content of one packet of **HI 93746-0** reagent, close the cylinder and shake well for 30 seconds. This is the blank.
   Fill a cuvette with 10 mL of the blank up to the mark and replace the cap.
4. Place the cuvette into the holder and ensure that the notch on the cap is positioned securely into the groove.
5. Press **ZERO/CFM** and the lamp, cuvette and detector icons will appear on the display, depending on the measurement phase.
   For Total Hardness: Place the ZERO sample into the holder and ensure that the notch on the cap is positioned securely into the groove. Press **ZERO/CFM** and the lamp, cuvette and detector icons will appear on the display, depending on the measurement phase. After a few seconds the display will show **"-0.0-"**. Remove the ZERO sample and insert the READ1 sample into the instrument. Press and hold **READ/▶/TIMER** for three seconds. The display will show the countdown prior to measurement. The beeper is playing a beep at the end of countdown period. Alternatively, wait for 30 seconds. The lamp, cuvette and detector icons will appear on the display, depending on the measurement phase, then the instrument will display the level of Magnesium hardness in mg/L $CaCO_3$ (togheter with "n").
6. After a few seconds the display will show **"-0.0-"**. The meter is now zeroed and ready for measurement (except for Hardness).
7. Remove the cuvette.
8. Add the specific test reagent for each parameter:
   pH: 5 drops of **HI 93710-0**, replace the cap and swirl the solution: invert several times to mix.
   Total hardness: the third cuvette (nothing is added)
   Iron LR: Fill one graduated mixing cylinder up to the 25 mL mark with the sample.
   Add the content of one packet of **HI 93746-0** reagent, close the cylinder and shake well for 30 seconds.
   Fill a cuvette with 10 mL of the reacted sample up to the mark and replace the cap.
9. Replace the cuvette into the holder and ensure that the notch on the cap is positioned securely into the groove.

10• Press and hold **READ/►/TIMER** for three seconds. The display will show the countdown prior to measurement (not for Hardness). The beeper is playing a beep at the end of countdown period.
Alternatively, wait for:
Iron LR: 30 seconds
Then press **READ/►/TIMER**.
For pH and Hardness press **READ/►/TIMER** directly.
In all cases the lamp, cuvette and detector icons will appear on the display, depending on the measurement phase.



11• The instrument directly displays the pH measured value or the concentration in mg/L of free chlorine, total chlorine or iron on the LCD, depending on the selected parameter.
For Hardness the instrument will display the concentration of Calcium in mg/L $CaCO_3$ (together with "C"). Press **READ/►/TIMER** again, the lamp, cuvette and detector icons will appear on the display, depending on the measurement phase. The isntrument will display the total hardness concentration in mg/L $CaCO_3$ (together with "t").



INTERFERENCES:

- Iron LR: Cadmium above 4.0 mg/L, Chromin6+ above 1.2 mg/L, Copper above 0.6 mg/L, Manganese above 50.0 mg/L, Molybdenum 4.0 mg/L, Nitrite ion above 0.8 mg/L, Chromium3+ above 0.25 mg/L, Cobalt above 0.05 mg/L, Cyanide above 2.8 mg/L, Mercury above 0.4 mg/L, Nickel above 1.0 mg/L.
- Total Hardness: Excessive amounts of heavy metals.

Note: If the sample is very acidic, some extra drops of **HI 93735B** buffer reagent may be added.

Validation and Calibration procedures

Warning: do not validate or calibrate the instrument with standard solutions other than the Hanna **CAL CHECK™** Standards, otherwise erroneous results will be obtained.
For accurate validation and calibration results, please perform tests at room temperature (18 to 25°C; 64.5 to 77.0°F).

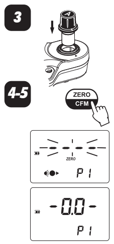
***i* Use the Hanna CAL CHECK™ cuvettes (see "Accessories") to validate or calibrate instruments.**

VALIDATION

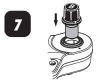
Validation ▼

Note: The validation is performed only for the selected parameter. For full validation of the instrument, the following procedure must be performed for each parameter.

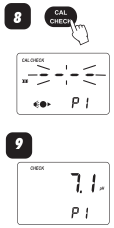
1• Turn the meter on by pressing **ON/OFF**.
2• When the beeper sounds briefly and the LCD displays dashes, the meter is ready.
3• Place the **CAL CHECK™** Standard Cuvette A into the cuvette holder and ensure that the notch on the cap is positioned securely into the groove.
4• Press **ZERO/CFM** and the lamp, cuvette and detector icons will appear on the display, depending on the measurement phase.
5• After a few seconds the display will show "**-0.0-**". The meter is now zeroed and ready for validation.



6• Remove the cuvette.
7• Place the specific **CAL CHECK™** Standard Cuvette B into the cuvette holder, for:
pH: **B, HI 96710-11**
Hardness: **B, HI 96719-11**
Iron LR: **B, HI 96746-11**
Ensure that the notch on the cap is positioned securely into the groove.



8• Press **CAL CHECK** key and the lamp, cuvette and detector icons together with "**CAL CHECK**" will appear on the display, depending on the measurement phase.
9• At the end of the measurement the display will show the validation standard value.
The reading should be within specifications as reported on the **CAL CHECK™** Standard Certificate. If the value is found out of specifications, please check that the cuvettes are free of fingerprints, oil or dirt and repeat validation. If results are still found out of specifications then recalibrate the instrument.

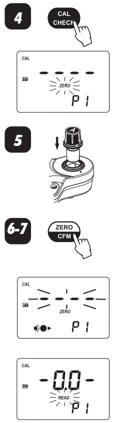


CALIBRATION

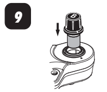
Calibration ▼

Note: It is possible to interrupt the calibration procedure at any time by pressing **CAL CHECK** or **ON/OFF** keys. When calibrating, only the selected range is affected.

1• Turn the meter on by pressing **ON/OFF**.
2• When the beeper sounds briefly and the LCD displays dashes, the meter is ready.
3• To change the range, simply press **RANGE/GLP/▲**.
4• Press and hold **CAL CHECK** for three seconds to enter *calibration mode*. The display will show "**CAL**" during calibration procedure. The blinking "**ZERO**" asks for instrument zeroing.
5• Place the **CAL CHECK™** Standard Cuvette A into the cuvette holder and ensure that the notch on the cap is positioned securely into the groove.
6• Press **ZERO/CFM** and the lamp, cuvette and detector icons will appear on the display, depending on the measurement phase.
7• After a few seconds the display will show "**-0.0-**". The meter is now zeroed and ready for calibration. The blinking "**READ**" asks for reading calibration standard.



8• Remove the cuvette.
9• Place the specific **CAL CHECK™** Standard Cuvette B into the cuvette holder, for:
pH: **B, HI 96710-11**
Hardness: **B, HI 96719-11**
Iron LR: **B, HI 96746-11**
Ensure that the notch on the cap is positioned securely into the groove.



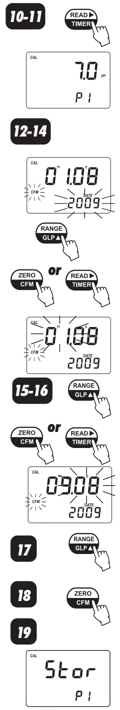
10• Press **READ/►/TIMER** and the lamp, cuvette and detector icons will appear on the display, depending on the measurement phase.
11• The instrument will show for three seconds the **CAL CHECK™** standard value.

Note: If the display shows "**STD HIGH**", the standard value was too high. If the display shows "**STD LOW**", the standard value was too low. Verify that both **CAL CHECK™** Standard Cuvettes, A and B are free from fingerprints or dirt and that they are inserted correctly.

12• Then the date of last calibration (e.g.: "**01.08.2009**") appears on the display, or "**01.01.2009**" if the factory calibration was selected before. In both cases the year number is blinking, ready for date input.
13• Press **RANGE/GLP/▲** to edit the desired year (2009-2099). If the key is kept pressed, the year number is automatically increased.
14• When the correct year has been set, press **ZERO/CFM** or **READ/►/TIMER** to confirm. Now the display will show the month blinking.
15• Press **RANGE/GLP/▲** to edit the desired month (01-12). If the key is kept pressed, the month number is automatically increased.
16• When the correct month has been set, press **ZERO/CFM** or **READ/►/TIMER** to confirm. Now the display will show the day blinking.
17• Press **RANGE/GLP/▲** to edit the desired day (01-31). If the key is kept pressed, the day number is automatically increased.

Note: It is possible to change the editing from day to year and to month by pressing **READ/►/TIMER**.

18• Press **ZERO/CFM** to save the calibration date.
19• The instrument displays "**Stor**" for one second and the calibration is saved.
20• The instrument will return automatically to *measurement mode* by displaying dashes on the LCD.



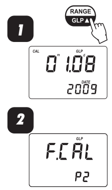
GLP

In *GLP mode*, the last calibration date can be verified and the factory calibration can be restored.

Last Calibration Date ▼

LAST CALIBRATION DATE

1• Press and hold **RANGE/GLP/▲** for three seconds to enter *GLP mode*. The calibration month and day will appear on the main display and the year on the secondary display.
2• If no calibration was performed, the factory calibration message, "**F.CAL**" will appear on the main display and the instrument returns to *measurement mode* after three seconds.

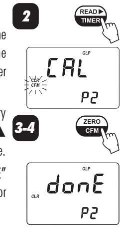


FACTORY CALIBRATION RESTORE

Factory Calibration Restore ▼

It is possible to delete the calibration and restore factory calibration.

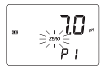
1• Press and hold **RANGE/GLP/▲** for three seconds to enter *GLP mode*.
2• Press **READ/►/TIMER** to enter in the factory calibration restore screen. The instrument asks for confirmation of user calibration delete.
3• Press **ZERO/CFM** to restore the factory calibration or press **RANGE/GLP/▲** again to abort factory calibration restore.
4• The instrument briefly indicates "**donE**" upon restoration of factory calibration prior to returning to *measurement mode*.



Battery management

To save the battery, the instrument shuts down after 10 minutes of non-use in *measurement mode* and after 1 hour of non-use in *calibration mode*.

If a valid measurement was displayed before auto-shut off, the value is displayed when the instrument is switched on. The blinking "**ZERO**" means that a new zero has to be performed.



One fresh battery lasts for arround 750 measurements, depending on the light level.

The remaining battery capacity is evaluated at the instrument startup and after each measurement.

The instrument displays a battery indicator with three levels as follows:

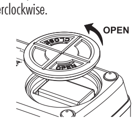
- 3 lines for 100 % capacity
- 2 lines for 66 % capacity
- 1 line for 33 % capacity
- Battery icon blinking if the capacity is under 10 %.

If the battery is empty and accurate measurements can't be taken any more, the instrument shows "**dEAd bAtt**" and turns off.

To restart the instrument, the battery must be replaced with a fresh one.

To replace the instrument's battery, follow the steps:

- Turn the instrument off by pressing **ON/OFF**.
- Turn the instrument upside down and remove the battery cover by turning it counterclockwise.



- Extract the battery from its location and replace it with a fresh one.
- Insert back the battery cover and turn it clockwise to close.

Accessories

REAGENT SETS

HI 93710-01	Reagents for 100 pH tests
HI 93710-03	Reagents for 300 pH tests
HI 93719-01	Reagents for 100 Hardness tests
HI 93719-03	Reagents for 300 Hardness tests
HI 93746-01	Reagents for 100 Iron Low Range tests
HI 93746-03	Reagents for 300 Iron Low Range tests

OTHER ACCESSORIES

HI 96710-11	**CAL CHECK™** Standard Cuvettes for pH (1 set)
HI 96719-11	**CAL CHECK™** Standard Cuvettes for Hardness (1 set) (equivalent with 1.00 mg/L Mg Hardness)
HI 96746-11	**CAL CHECK™** Standard Cuvettes for Iron LR (1 set)
HI 721310	9V battery (10 pcs.)
HI 731318	Cloth for wiping cuvettes (4 pcs.)
HI 731331	Glass cuvettes (4 pcs.)
HI 731335	Caps for cuvettes
HI 93703-50	Cuvette cleaning solution (230 mL)

Warranty

HI 96744 is warranted for two years against defects in workmanship and materials when used for its intended purpose and maintained according to the instructions.
This warranty is limited to repair or replacement free of charge.
Damages due to accident, misuse, tampering or lack of prescribed maintenance are not covered.
If service is required, contact your dealer. If under warranty, report the model number, date of purchase, serial number and the nature of the failure. If the repair is not covered by the warranty, you will be notified of the charges incurred.
If the instrument is to be returned to Hanna Instruments, first obtain a Returned Goods Authorization Number from the Customer Service Department and then send it with shipment costs prepaid. When shipping any instrument, make sure it is properly packaged for complete protection.
To validate your warranty, fill out and return the enclosed warranty card within 14 days from the date of purchase.

Recommendations for Users

Before using these products, make sure that they are entirely suitable for your specific application and for the environment in which they are used.

Operation of these instruments may cause unacceptable interferences to other electronic equipments, this requiring the operator to take all necessary steps to correct interferences.

Any variation introduced by the user to the supplied equipment may degrade the instrument's EMC performance.

To avoid damages or burns, do not put the instrument in microwave oven. For yours and the instrument safety do not use or store the instrument in hazardous environments.

For additional information, contact your dealer or the nearest

Hanna Customer Service Center. To find the Hanna Office in your area, visit our web site

www.hannainst.com

HANNA® instruments

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